5.0 WATER CHEMISTRY

At each sampling site, teams will record stream temperature and fill one 4-L container and two 60 mL syringes with streamwater. (If concurrent water samples are to be analyzed by another laboratory, then an adequate amount of additional streamwater must be collected.) These samples are stored in a cooler packed with plastic bags filled with ice and are shipped or driven to the analytical laboratory within 24 hours of collection (see Section 3). The primary purposes of the water samples are to determine:

- Acid-base status
- Trophic condition (nutrient enrichment)
- Chemical Stressors (metals, toxicants)
- Classification of water chemistry type.

Water from the 4-L bulk sample is used to measure the major cations and anions, conductivity, acid neutralizing capacity, dissolved organic carbon, nutrients, turbidity, total suspended solids, and color. The syringe samples are analyzed for pH and dissolved inorganic carbon. Syringes are used to seal off the samples from the atmosphere because the pH, dissolved inorganic carbon (DIC) will all change if the streamwater equilibrates with atmospheric CO_2. Overnight express mail for these samples is required because the syringe samples need to be analyzed, and the 4-L bulk sample needs to be stabilized (by filtration and/or acidification) within a short period of time (72 hours) after collection.

5.1 SAMPLE COLLECTION

Before leaving the base location, fill out a set of water chemistry sample labels as shown in Figure 5-1. Attach a completed label to the cubitainer and each of two syringes and cover with clear tape strips as described in Section 3. Make sure the syringe labels do not cover the volume gradations. Package the pre-labeled containers and the sampling beaker in a small plastic trash bag to prevent contamination (see Section 3). In the field, make sure that the labels all have the same sample ID number (barcode), and that the labels are securely attached.

The procedure to collect a water chemistry sample is described in Table 5-1. Collect the sample from the middle of the stream channel at the X-site, unless no water is present at that location (see Section 4). It is important to take precautions to avoid contaminating the sample. Rinse all sample containers three times with portions of stream water before filling them with the sample. Many streams have a very low ionic strength and can be contaminated quite easily by perspiration from hands, sneezing, smoking, insect repellent, hand sanitizers, or other chemicals used when collecting other types of samples. Thus, make sure that none of the water sample contacts your hands before going into the cubitainer. All of the chemical analyses conducted using the syringe samples are affected by equilibration with atmospheric carbon dioxide; thus, it is essential that no outside air contact the syringe samples during or after collection. Record the information from the sample label on the Sample Collection Form as shown in Figure 5-2. Note any problems related to possible contamination in the comments section of the form.

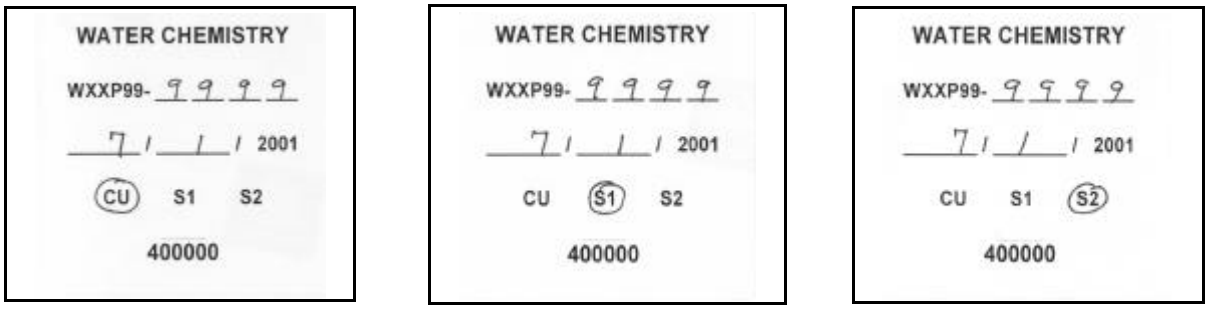


Figure 5-1. Completed sample labels for water chemistry.

TABLE 5-1. SAMPLE COLLECTION PROCEDURES FOR WATER CHEMISTRY

Collect the water samples from the X-site in a flowing portion near the middle of the stream.

1. Rinse the 500 mL sample beaker three times with streamwater, Discard the rinse downstream.

2. Remove the cubitainer lid and expand the cubitainer by pulling out the sides. **NOTE: DO NOT BLOW into the cubitainers to expand them, this will cause contamination.**

3. Fill the beaker with streamwater and slowly pour 30-50 mL into the cubitainer. Cap the cubitainer and rotate it so that the water contacts all the surfaces. Discard the water downstream. Repeat this rinsing procedure two more times.

4. Collect additional portions of streamwater with the beaker and pour them into the cubitainer. Let the weight of the water expand the cubitainer. The first two portions will have to be poured slowly as the cubitainer expands. Fill the cubitainer to at least three-fourths of its maximum volume. Rinse the cubitainer lid with streamwater. Eliminate any air space from the cubitainer, and cap it tightly. Make sure the cap is tightly sealed and not on at an angle.

5. Place the cubitainer in a cooler (on ice or streamwater) and shut the lid. If a cooler is not available, place the cubitainer in an opaque garbage bag and immerse it in the stream.

6. Submerge a 60-mL syringe halfway into the stream and withdraw a 15-20 mL aliquot. Pull the plunger to its maximum extension and shake the syringe so the water contacts all surfaces. Point the syringe downstream and discard the water by depressing the plunger. Repeat this rinsing procedure two more times.

7. Submerge the syringe into the stream again and **slowly** fill the syringe with a fresh sample. Try not to get any air bubbles in the syringe. If more than 1-2 tiny bubbles are present, discard the sample and draw another one.

8. Invert the syringe (tip pointing up), and cap it with a syringe valve. Tap the syringe lightly to detach any trapped air bubbles. With the valve open, expel the air bubbles and a small volume of water, leaving between 50 and 60 mL of sample in the syringe. Close the syringe valve. If any air bubbles were drawn into the syringe during this process, discard the sample and fill the syringe again (Step 7).

9. Repeat Steps 6 through 8 with a second syringe. Place the syringes together in the cooler or in the streamwater with the cubitainer.

10. Record the barcode number (Sample ID) on the Sample Collection Form along with the pertinent stream information (stream name, ID, date, etc.). Note anything that could influence sample chemistry (heavy rain, potential contaminants) in the Comments section. If the sample was collected at the X-site, record an "X" in the "STATION COLLECTED" field. If you had to move to another part of the reach to collect the sample, place the letter of the nearest transect in the "STATION COLLECTED" field. Record more detailed reasons and/or information in the Comments section.

11. After carrying the samples out to the vehicles, place the cubitainer and syringes in a cooler and surround with 1 gallon self-sealing plastic bags filled with ice. The cooler should first be lined with the heavy grade plastic trash bag provided in the Site Kit. **Note: the syringes must be placed in the protective plastic container provided in the Site KIt.*

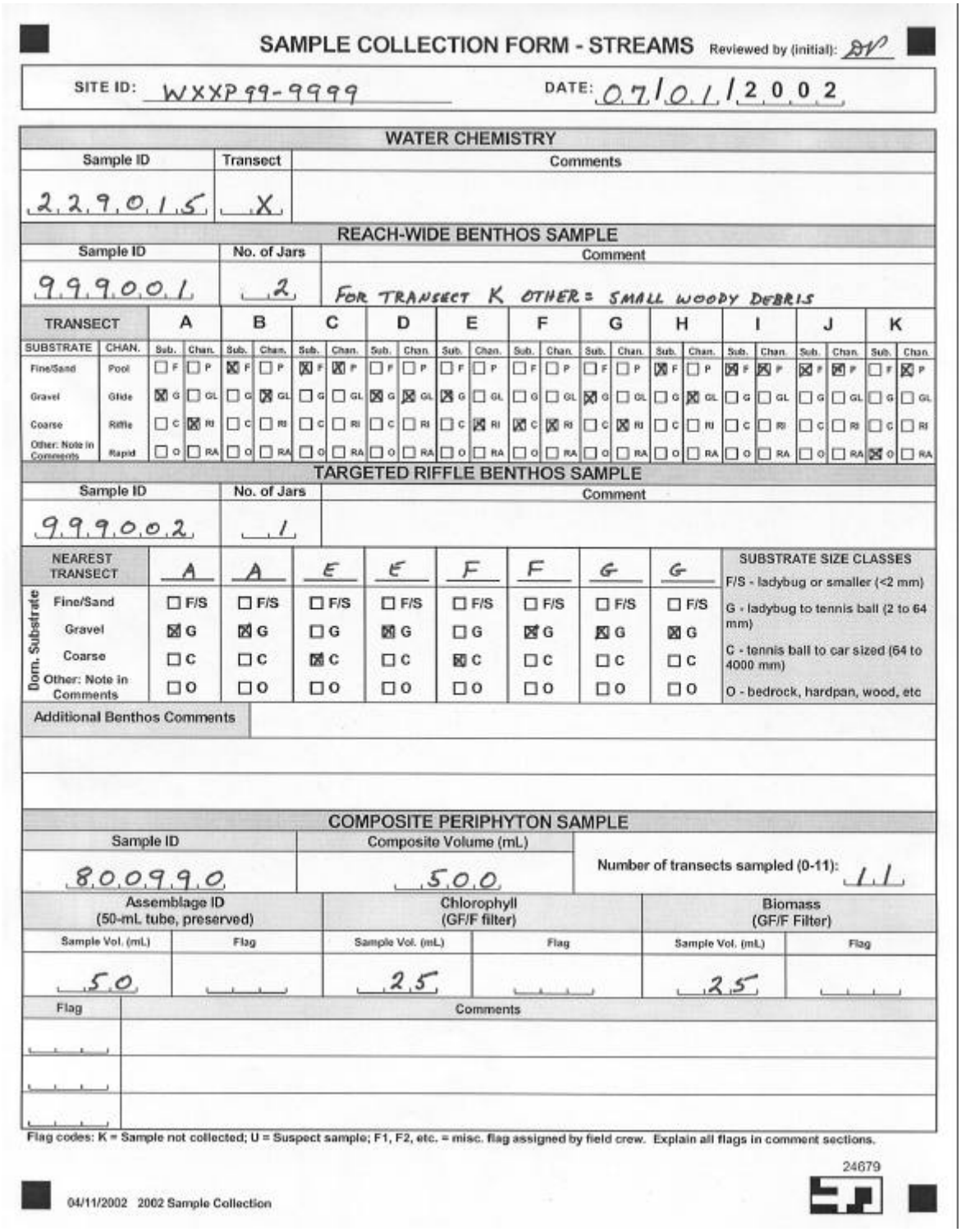
12. **Water chemistry samples must be shipped via overnight delivery within 24 hours of collection.** The syringes must be placed in the protective plastic container, and the cubitainer and the plastic container of syringes must be placed in the cooler and surrounded by 1 gallon self-sealing plastic bags filled with ice. The cooler should first be lined with the heavy grade plastic trash bag provided in the Site Kit. This will help prevent leaking, which would cause shipping delays and compromise the sample.

5.2 FIELD MEASUREMENT FOR TEMPERATURE

Stream temperature should be measured at the X-site (even if the reach has been adjusted by "sliding" it) using the field thermometer. Wait at least 1 minute for the displayed reading to stabilize, and record the stream temperature on the Channel Constraint and Field Chemistry Form (Figure 5-3).

5.3 EQUIPMENT AND SUPPLIES

A list of equipment and supplies required to collect samples and field data for the water chemistry indicator is presented in Table 5-2. This checklist is similar to the checklist presented in Appendix A, which is used at the base location (Section 3) to ensure that all of the required equipment is brought to the stream. Use this checklist to ensure that equipment and supplies are organized and available at the stream site in order to conduct the activities efficiently.



SAMPLE COLLECTION FORM - STREAMS Reviewed by (initial): DV

SITE ID: WXXP99-9999 DATE: 07/01/2002

WATER CHEMISTRY

Sample ID	Transect	Comments
229015	X	

REACH-WIDE BENTHOS SAMPLE

Sample ID	No. of Jars	Comment
999001	2	FOR TRANSECT K OTHER = SMALL WOODY DEBRIS

TRANSECT		A		B		C		D		E		F		G		H		I		J		K	
SUBSTRATE	CHAN.	Sub.	Chan.	Sub.	Chan.	Sub.	Chan.	Sub.	Chan.	Sub.	Chan.	Sub.	Chan.	Sub.	Chan.	Sub.	Chan.	Sub.	Chan.	Sub.	Chan.	Sub.	Chan.
Fine/Sand	Pool	☐ F	☐ P	☒ F	☐ P	☒ F	☐ P	☒ F	☐ P	☐ F	☐ P	☐ F	☐ P	☐ F	☐ P	☒ F	☐ P	☒ F	☒ P	☒ F	☒ P	☐ F	☒ P
Gravel	Glide	☒ G	☐ GL	☐ G	☒ GL	☐ G	☐ GL	☒ G	☒ GL	☒ G	☐ GL	☐ G	☐ GL	☒ G	☐ GL	☐ G	☒ GL	☐ G	☐ GL	☐ G	☐ GL	☐ G	☐ GL
Coarse	Riffle	☐ C	☒ RI	☐ C	☐ RI	☐ C	☐ RI	☐ C	☐ RI	☐ C	☒ RI	☒ C	☒ RI	☐ C	☒ RI	☐ C	☐ RI	☐ C	☐ RI	☐ C	☐ RI	☐ C	☐ RI
Other: Note in Comments	Rapid	☐ O	☐ RA	☐ O	☐ RA	☐ O	☐ RA	☐ O	☐ RA	☐ O	☐ RA	☐ O	☐ RA	☐ O	☐ RA	☐ O	☐ RA	☐ O	☐ RA	☐ O	☐ RA	☒ O	☐ RA

TARGETED RIFFLE BENTHOS SAMPLE

Sample ID	No. of Jars	Comment
999002	1	

NEAREST TRANSECT	A	A	E	E	F	F	G	G
Dom. Substrate: Fine/Sand	☐ F/S	☐ F/S	☐ F/S	☐ F/S	☐ F/S	☐ F/S	☐ F/S	☐ F/S
Gravel	☒ G	☒ G	☐ G	☒ G	☐ G	☒ G	☒ G	☒ G
Coarse	☐ C	☐ C	☒ C	☐ C	☒ C	☐ C	☐ C	☐ C
Other: Note in Comments	☐ O	☐ O	☐ O	☐ O	☐ O	☐ O	☐ O	☐ O

SUBSTRATE SIZE CLASSES
F/S - ladybug or smaller (<2 mm)
G - ladybug to tennis ball (2 to 64 mm)
C - tennis ball to car sized (64 to 4000 mm)
O - bedrock, hardpan, wood, etc

Additional Benthos Comments

COMPOSITE PERIPHYTON SAMPLE

Sample ID	Composite Volume (mL)	Number of transects sampled (0-11):
800990	500	11

Assemblage ID (50-mL tube, preserved)		Chlorophyll (GF/F filter)		Biomass (GF/F Filter)	
Sample Vol. (mL)	Flag	Sample Vol. (mL)	Flag	Sample Vol. (mL)	Flag
50		25		25	

Flag	Comments

Flag codes: K = Sample not collected; U = Suspect sample; F1, F2, etc. = misc. flag assigned by field crew. Explain all flags in comment sections.

24679

04/11/2002 2002 Sample Collection

Figure 5-2. Sample Collection Form, showing data recorded for water chemistry samples.

CHANNEL CONSTRAINT AND FIELD CHEMISTRY - STREAMS/RIVERS

Reviewed by (initial): DP

SITE ID: WXXP99-9999 DATE: 07/01/2001

IN SITU MEASUREMENTS	Station ID: (Assume X-site unless marked)
	Comments
STREAM/RIVER DO mg/l: (optional) 5.3	
STREAM RIVER TEMP. (°C): 20.5	
TIME OF DAY: 11:25	

CHANNEL CONSTRAINT

CHANNEL PATTERN (Check One)

- ☒ **One channel**
- ☐ **Anastomosing (complex) channel** - (Relatively long major and minor channels branching and rejoining.)
- ☐ **Braided channel** - (Multiple short channels branching and rejoining - mainly one channel broken up by numerous mid-channel bars.)

CHANNEL CONSTRAINT (Check One)

- ☐ **Channel very constrained in V-shaped valley** (i.e. it is very unlikely to spread out over valley or erode a new channel during flood)
- ☐ **Channel is in Broad Valley** but channel movement by erosion during floods is **constrained by Incision** (Flood flows do not commonly spread over valley floor or into multiple channels.)
- ☐ **Channel is in Narrow Valley but is not very constrained**, but limited in movement by relatively narrow valley floor (< ~10 x bankfull width)
- ☒ **Channel is Unconstrained in Broad Valley** (i.e. during flood it can fill off-channel areas and side channels, spread out over flood plain, or easily cut new channels by erosion)

CONSTRAINING FEATURES (Check One)

- ☐ **Bedrock** (i.e. channel is a bedrock-dominated gorge)
- ☐ **Hillslope** (i.e. channel constrained in narrow V-shaped valley)
- ☐ **Terrace** (i.e. channel is constrained by its own incision into river/stream gravel/soil deposits)
- ☐ **Human Bank Alterations** (i.e. constrained by rip-rap, landfill, dike, road, etc.)
- ☒ **No constraining features**

Percent of channel length with margin in contact with constraining feature: 0 % ---> (0-100%)

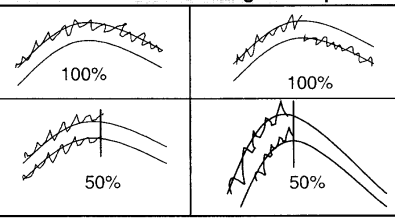
Bankfull width: 6 (m)

Valley width (Visual Estimated Average): 2000 (m)

Note: Be sure to include distances between both sides of valley border for valley width.

If you cannot see the valley borders, record the distance you can see and mark this box. ☒

Percent of Channel Margin Examples



Comments: VALLEY WIDTH > 2000 Meters

38480

03/26/2001 2001 Chan Con/Fld Chem

Figure 5-3. Channel Constraint and Field Measurement Form, showing data recorded for water chemistry.

TABLE 5-2. CHECKLIST OF EQUIPMENT AND SUPPLIES FOR WATER CHEMISTRY

QTY.	Item
1	Field thermometer
1	500 mL plastic beaker with handle (in clean plastic bag)
1	4-L cubitainer with completed sample label attached (in clean plastic bag)
2-4	60 mL plastic syringes (with Luer type tip) with completed sample labels attached
1	Plastic container with snap-on lid to hold filled syringes
2-4	Syringe valves (Mininert® with Luer type adapter, or equivalent, available from a chromatography supply company)
1	Cooler with 4 to 6 plastic bags (1-gal) of ice OR a medium or large opaque garbage bag to store the water sample at streamside
1	Sample Collection From
1	Field Measurement Form
	Soft-lead pencils for filling out field data forms
	Fine-tipped indelible markers for filling out labels
1 copy	Field operations and methods manual
1 set	Procedure tables and/or quick reference guides for water chemistry (laminated or printed on write-in-the-rain paper)

NOTES